

CONNECTION OF SIEMENS PLC TO LABVIEW USING OPC

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JUDUL: CONNECTION OF SIEMENS PLC TO LABVIEW USING
OPC

SESI PENGAJIAN: 2004/2005

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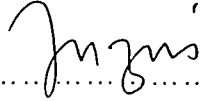
MAHFUZH MUSTAFA

**A thesis submitted
as partial in fulfilment of the requirements for the award
of the degree of Master of Electrical Engineering**

**Fakulti Kejuruteraan Elektrik Dan Elektronik
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DEDICATION

*For those who pray my success and
For those waiting for my success*

ACKNOWLEDGEMENT

Firstly, I would like to praise and thank the almighty Allah S.W.T for giving me the determination and the ability to complete this project.

Then, I wish to extend my sincere appreciation to Mr. Van Raaij my dedicated supervisor at Germany, for his continuous supervision, guidance, advice and constructive ideas throughout the course of this study and making this project successful. For supervisor at Malaysia, Dr. Mohamad Nor and Professor Mortaza, thank you for supervision at Malaysia.

I extend my sincere gratitude to my friend at Georg-Simon-Ohm-Fachhochschule Nürnberg Christian, Kristian and Martin for guidance, support and encouragement during the project.

Finally, I would like to express my indebtedness to my family for their moral support, encouragement and invaluable assistance in all my undertaking.

ABSTRACT

The project is to enable the Siemens PLC (Programmable Logic Control) S7-300 to communicate with the LabVIEW. The communication between S7-300 and LabVIEW is via OPC (OLE for Process Control). Development of OPC using SIMATIC NET OPC Server. OPC is industry standard provides real plug-and-play software technology for process control and factory automation. OPC integrate software and hardware across spectrum of vendors easily. Visualization of Festo Didactic process developed using LabVIEW. Festo Didactic is small system which consist actuators and sensors .The process of Festo is to make hole for three different material red plastic, black plastic and metal. PROFIBUS is a medium to transfer data from PLC to LabVIEW or LabVIEW to PLC.

ABSTRAK

Projek ini membolehkan komunikasi di antara Siemens PLC (Programmable Logic Control) S7-300 dengan LabVIEW. Komunikasi di antara PLC dengan LabVIEW adalah melalui OPC (OLE for Process Control). Pembangunan OPC menggunakan SIMATIC NET OPC Server. OPC adalah industri standard yang memberikan keadaan sebenar plug-and-play teknologi perisian untuk kawalan process dan automasi industri.. OPC juga mengintegrasikan perisian dan perkakasan bagi semua pembekal dengan mudah. Visualisasi proses Festo Didactic dibangunkan dengan menggunakan LabVIEW. Festo Didactic adalah system kecil yang mengandungi banyak pengesan dan pengerak. Proses yang dijalankan oleh Festo adalah melubangkan tiga jenis bahan iaitu plastik berwarna merah, plastic berwarna hitam dan juga logam. PROFIBUS adalah media yang digunakan untuk menghantar data dari PLC ke LabVIEW atau LabVIEW ke PLC.

TABLE OF CONTENT

CONTENTS	PAGE
ABSTRACT	i
ABSTRAK	ii
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	ix
LIST OF APPENDICES	x
INTRODUCTION	1
1.1 Problem Statement	2
1.2 Project Overview	3
1.3 Project Aim	4
1.4 Objectives	4
1.5 Project Scope	5
THEORITICAL BACKGROUND	6
2.1 OPC (<i>OLE for Process Control</i>)	6
2.1.1 OPC Background	6
2.1.2 OPC Object and Interface	8
2.1.3 General OPC Architecture and Components	8
2.1.4 Benefit of OPC	9
2.2 PROFIBUS	10
2.2.1 PROFIBUS Background	10
2.2.2 Technical Data of PROFIBUS DP	11
2.2.3 PROFIBUS Transmission	13
2.2.4 Pinout of PROFIBUS Port-9 pin sub-D female	14
2.2.5 Terminating Resistor	15
2.2.6 PROFIBUS DP Response Time	16
LITERATURE REVIEW	17
3.1 OPC (<i>OLE for Process Control</i>)	17
3.2 PROFIBUS and PLC	20
3.3 LabVIEW	21
METHODOLOGY	23
4.1 Problem Statement	23
4.2 Literature Review	24
4.3 Specifications	24
4.4 First Phase	24
4.5 Second Phase	25
4.6 Third Phase	26

HARDWARE AND SOFTWARE SPECIFICATIONS	28
5.1 Hardware Specifications	28
5.1.1 Computer	28
5.1.2 CP5611	29
5.1.3 Siemens PLC S7-300	29
5.1.3.1 Power supply (PS 3072A)	29
5.1.3.2 CPU (CPU315-2DP)	30
5.1.3.3 Digital Input (SM321 DI32xDC24V)	30
5.1.3.4 Analog Input (SM332 AI8x12BIT)	30
5.1.3.5 Digital Output (SM322 DO32xDC24V/0.5A)	30
5.1.3.6 Stepper motor module (FM355)	31
5.1.4 Festo Didactic	31
5.1.4.1 Distributing Station	32
5.1.4.2 Testing Station	33
5.1.4.3 Processing Station	34
5.1.4.4 Storing Station	35
5.1.5 PROFIBUS	36
5.2 Software Specifications	36
5.2.1 Windows NT	36
5.2.2 SIMATIC STEP 7	37
5.2.3 SIMATIC NET	37
5.2.4 LabVIEW	37
RESULTS	39
6.1 OPC Server	39
6.2 Visualization of Festo Didactic by LabVIEW	42
6.2.1 Festo Didactic from Top View	43
6.2.2 Description and Tips	44
6.2.3 Initialization, Identify Material and Stepper Motors	45
6.2.4 Error	47
6.2.5 Button	49
6.3 System Speed Tester	50
CONCLUSIONS	55
7.1 Recommendations	56
BIBLIOGRAPHY	57
Appendix A: Data block and address for Festo Didactic	
Appendix B: Flow process of Festo Didactic	
Appendix C: Manual for Connection of Siemens PLC to LabVIEW using OPC	

Appendix D: LabVIEW Programming and Data from PLC
READ and WRITE by OPC Scout

LIST OF TABLES

NO	TITTLE	PAGE
2.1	Transmission rate	12
2.2	Transmission technology of RS485	13
2.3	Description of Pinout- 9-Pin Sub-D Female Connector (PROFIBUS)	14
5.1	Recognition module by sensors	34
6.1	Capacitive, light and inductive sensors	46
6.2	Types of errors	48
6.3	Button function	49

LIST OF FIGURES

NO	TITTLE	PAGE
1.1	The connection between S7-300 and LabVIEW via OPC	4
2.1	Process Control Information Architecture	7
2.2	OPC Client/Server Relationship	8
2.3	OPC Interface	8
2.4	The OSI reference model	11
2.5	PROFIBUS (RS485)	13
2.6	Pinout- 9-Pin Sub-D Female Connector (PROFIBUS)	14
2.7	Diagram of Terminating Resistor	15
2.8	PROFIBUS bus connector (6ES7 972-0BB12-)XA0)	15
2.9	Bus cycle time of PROFIBUS DP	16
3.1	Before OPC	19
3.2	After OPC	19
4.1	Flow chart of methodology	27
5.1	S7-300 Siemens PLC	29
5.2	Festo Didactic	31
5.3	Pile magazine	32
5.4	Vacuum suction pad	32
5.5	Capacitive, Light and Inductive sensors	33
5.6	Lifting module	33
5.7	Rotary linear cylinder	35
5.8	Robot arm unit	35
6.1	Station Configuration Editor	40

6.2	Network from Computer1 to S7-300	40
6.3	Network from Computer1 to S7-300	41
6.4	OPC Scout	42
6.5	Front panel LabVIEW of the system	43
6.6	Visualization from top view of Festo Didactic	44
6.7	Actuator 1Y1	45
6.8	Address for metal counter	45
6.9	Data for initialization, identify material and Stepper motor	46
6.10	Table for FM353 data	47
6.11	Error detection of the system	48
6.12	Button to control Festo Didactic from LabVIEW	49
6.13	PLC cycle time on Computer2	51
6.14	Configured PROFIBUS speed of 187.5 Kbps	52
6.15	Configured PROFIBUS speed of 1.5 Mbps	53
6.16	Configured PROFIBUS speed of 12 Mbps	54

LIST OF ABBREVIATIONS

DDE	-	Dynamic Data Exchange
DP	-	Decentralized Periphery
FBD	-	Function Block Diagram
FMS	-	Fieldbus Message Specification
I/O	-	Input/Output
LabVIEW	-	Laboratory Virtual Instrument Engineering Workbench.
LAD	-	Ladder Logic
LED	-	Light Emitting Diode
MPI	-	Multipoint Interface
OLE	-	Object Linking and Embedding
PC	-	Personal Computer
PCI	-	Peripheral Component Interconnect
PLC	-	Programmable Logic Control
PROFIBUS	-	Process Field Bus
STL	-	Statement List
TCP/IP	-	Transmission Control Protocol / Internet Protocol
VI	-	Virtual Instrument
WinCC	-	Window Control Centre

LIST OF APPENDICES

APPENDIX	TITTLE	PAGE
A	Data block and address for Festo Didactic	59
B	Flow process of Festo Didactic	65
C	Manual for Connection of Siemens PLC to LabVIEW Using OPC	70
D	LabVIEW Programming and Data from PLC READ And WRITE by OPC Scout	98

CHAPTER I

INTRODUCTION

Traditionally, the industrial automation market has seen a proliferation of proprietary interface standards. Hundreds of different and incompatible proprietary interface standards developed by suppliers are required to communicate with automation systems and devices. There is a barrier because of incompatibilities and proprietary communication interfaces between different suppliers' automation hardware and software [19]. Using proprietary interface method locked users into particular vendor. If users required changes in system, users were forced to return to the same vendor and subsequently forced to pay for solutions that were not always optimal. Creating a multivendor system, in automation company which can choose and apply the best products and systems for any given application often requires to invest a significant amount of money on system integration. The money invested is not just to get the desired automation and control functionality from the system. Much effort is required to ensure that the systems, can share information and interoperate with other automation and business systems in the plant or factory.

OPC (*OLE for Process Control*) removes barriers between traditionally proprietary factory floor devices, systems and other manufacturing software. OPC is open connectivity in industrial automation and the enterprise systems that support industry [19]. The standard that enables integrators to connect disparate systems together, creating robust solutions and providing true interoperability; while at the same time reducing

implementation time and costs. Interoperability is assured through the creation and maintenance of open standard specifications [19]. The OPC enables a fully scalable solution for future changes and expansion. The users no longer tied or locked in to a single vendor. In addition, long-term maintenance and upgrading can be done by removing and replacing individual components in a system without any work needed to “wire up” the new pieces [19]. The advantage of OPC to supplier is reducing their time in driver development so they focus on at communication to end device, rather than worrying about different client communication schemes [19]. At the end, vendor become more competitive and offer superior product and solution to maintain their products and customers.

1.1 Problem Statement

Now day, application software should readily communicate with digital plant-floor devices as well as other applications. Most manufacturers pressing need of making hardware and software work together. The main problem of manufacturers is interfaces not standard. The proprietary system not integrates among each other.

In the absence of any standard, vendors have developed proprietary hardware and software solutions. Integrating different systems increase cost to manufacturer as well as long term maintenance and support. The custom drivers and interfaces can be written, but day by day thousands of different types of control devices and software packages increases rapidly. The other problem faces by manufactures are inconsistencies among different vendors’ drivers, hardware features that are not universally supported, hardware upgrades that can wreck an existing driver, and access conflicts. When supplier comes out with new controller, software developers have to write a new driver. Each time manufacturer purchase new controller then they also has to buy new driver for the controller. This problem adding manufacturer costs.

All the problem should be solve of getting a variety of systems to work together. The solution is having a standard that provides real plug-and-play software technology for process control and factory automation for every system, every device and every driver can freely communicate, connect and integrated. The standard is OPC (*OLE for Process Control*) where OLE is Object Linking and Embedding.

Formerly student at Georg-Simon Ohm, Fachhochschule Nürnberg, Germany develop a proprietary which Siemens PLC (S7-300) with Siemens software, WinCC (*Window Control Centre*). The OPC verified through this project which Siemens PLC (S7-300) integrated with LabVIEW.

1.2 Project Overview

Figure 1.1 shows the overview of the project. This project developed using a small factory automation called Festo Didactic. Important of the project is used OPC as the connection between Siemens PLC (S7-300) and LabVIEW. The Computer1 consist OPC which OPC Server configured by SIMATIC NET. The SIMATIC NET is software from Siemens to develop OPC Server. LabVIEW as OPC Client and also as visualization interface for Festo Didactic. Festo Didactic is small system consist sensors, actuators and stepper motors. The connection Computer1 to S7-300 is via PROFIBUS. To enable this communication, a module card CP5611 installed at Computer1. The CP5611 installed at any free PCI (*Peripheral Component Interconnect*) slot on the Computer1. The PLC connects directly to sensors, actuators and stepper motors at Festo Didactic. The Computer2 configured hardware S7-300 and connection via MPI (*Multipoint Interface*) and PROFIBUS. The Computer2 created PLC programming via STEP7. The STEP7 is software from Siemens to write a Siemens PLC programming. The description of Festo will discuss on Chapter 5 on Hardware specifications.

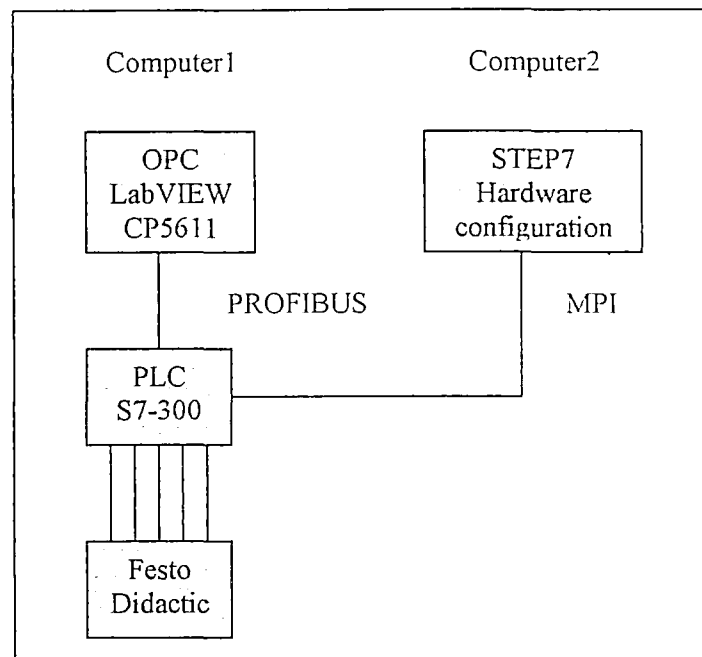


Figure 1.1: The connection between S7-300 and LabVIEW via OPC

1.3 Project Aim

The aim of this project is to develop an OPC for Festo Didactic

1.4 Objectives

The objectives of the project are:-

1. Develop OPC Server and OPC Client.
2. Enable the connection from Computer to Siemens PLC (S7-300) through PROFIBUS (RS485).
3. Develop the visualization for the Festo Didactic using LabVIEW.
4. Enhancing PROFIBUS (RS485) from 1.5 Mbps to 12 Mbps.
5. Performance Test and find out the limitations

1.5 Project Scope

The project concentrated development on OPC, LabVIEW and CP5611 module card. The project also concentrated on transmission technology via PROFIBUS (RS485). The formerly student, at Georg-Simon-Ohm, Fachhochschule Nürnberg, Germany has been done development on Siemens PLC (S7-300) to Festo Didactic, WinCC (*Window Control Centre*) and MPI connection.

CHAPTER II

THEORETICAL BACKGROUND

2.1 OPC (*OLE for Process Control*)

As Computer becomes more and more important even in industrial automation. Most Computer interface based on Microsoft Windows technologies. The first solution provided with Microsoft 3.1 was the Dynamic Data Exchange (DDE). Although an open and finally widely accepted standard its communication performance was not satisfactory. The development of the OPC (OLE for Process Control) architecture aims at solving the question of performance while providing an open interface standard between application.

2.1.1 OPC Background

A standard mechanism for communicating to numerous data sources, either devices on the factory floor, or a database in a control room is the motivation for OPC. The architecture for the Process Industry shown in Figure 2.1 involves the following levels:

1. Field Management is to provide data on the health of a device, its configuration parameters, materials of construction, etc. The data must be presented to the user, and any applications using it, in a consistent manner.